U. S. DEPARTMENT OF THE INTERIOR

U. S. GEOLOGICAL SURVEY

Preliminary Geologic Map of the Topanga Quadrangle Southern California

by

R. F. Yerkes[1] and R. H. Campbell [2]

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[1] MS 975, 345 Middlefield Road
Menlo Park, CA 94025

[2]MS 922, National Center,
Reston, VA 22092

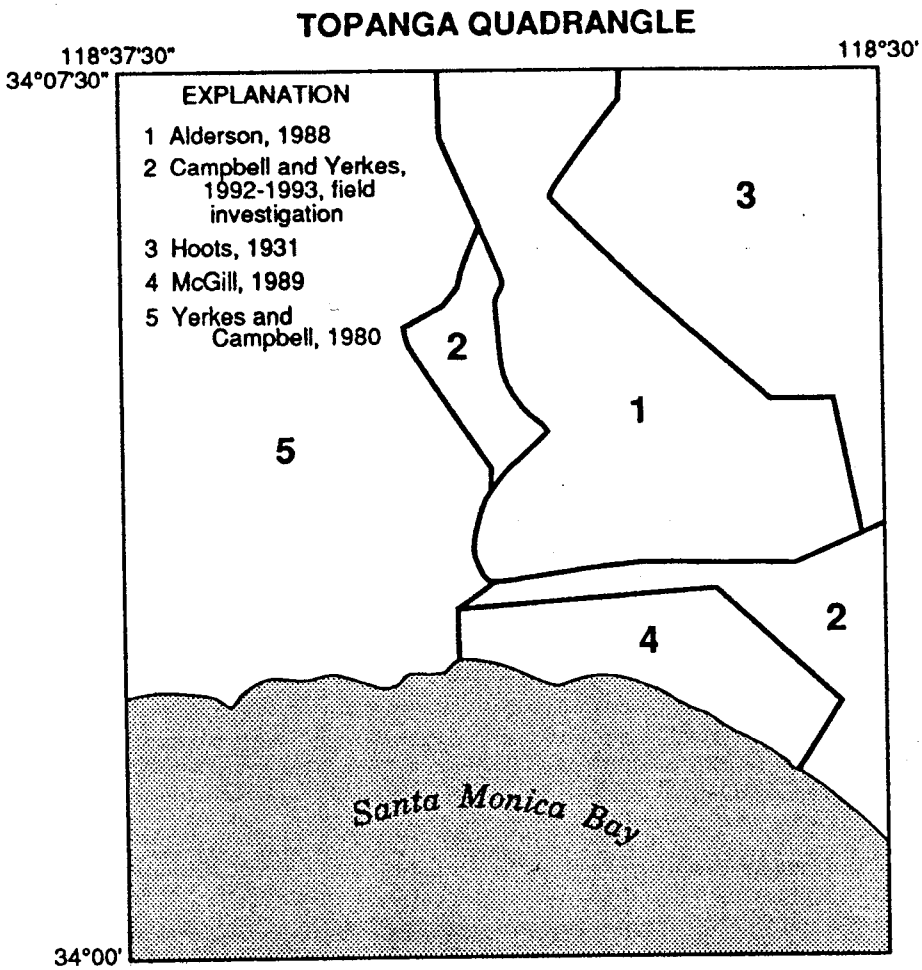
INTRODUCTION

This map is a preliminary product of the digital 1:100,000 Geologic Map Series (Morton and Kennedy, 1989). The 1:24,000 compilation was scanned and processed digitally using the U.S. Geological Survey Alacarte menu-driven adaptation (Wentworth and Fitzgibbon, 1991) of the Arc/Info Geographic Information System. Minor adjustments have been made in geologic boundaries to conform to the metric base, which was enlarged from 1:100,000.

This 1:24:000 quadrangle is one of 16 that form the west half of the Los Angeles 1:100,000 quadrangle; the 1:24,000-scale maps are intended to form the basic data supporting the regional-scale quadrangles, and thus contain data on known exploratory wells and fossil collections.

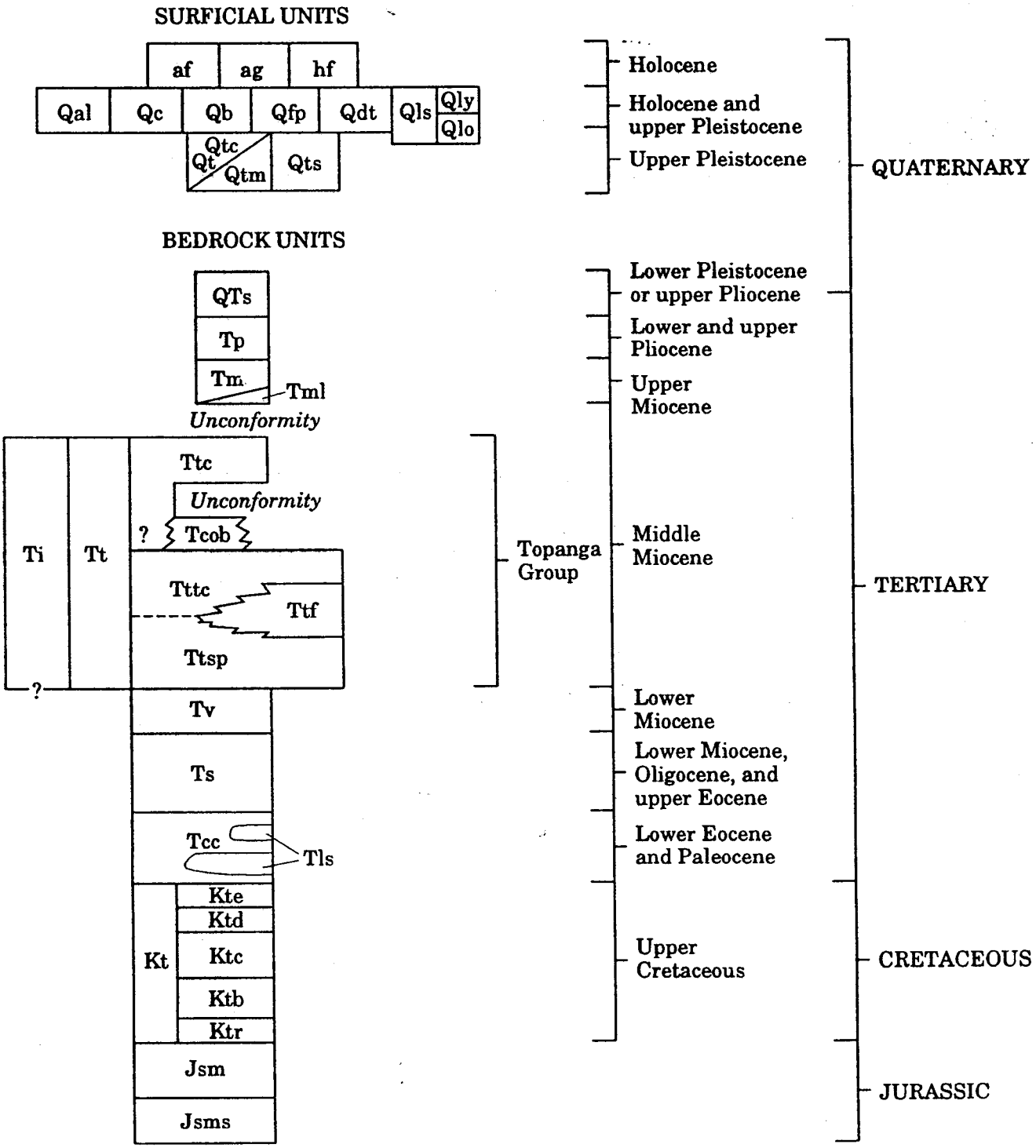
Stratigraphic nomenclature is largely that of the source materials, modified where possible to reflect that of Yerkes and Campbell (1979), particularly in regard to units of the Topanga Group; nomenclature is subject to further modification as compilation progresses.

The map for this report consists of two plates: the 1:24,000 quadrangle (plate 1), and a 1:12,000 enlargement of the Pacific Palisades area (plate 2), originally mapped at 1:4800 (McGill, 1989).



INDEX MAP SHOWING SOURCES OF GEOLOGIC MAPPING

CORRELATION OF MAP UNITS, TOPANGA QUADRANGLE



EXPLANATION, PRELIMINARY GEOLOGIC MAP, TOPANGA QUADRANGLE

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

af Artificial fill, in roadways and building sites

ag Artificially graded land (in Pacific Palisades)-both cut and fill, geology concealed by construction or plant cover

hf Hydraulic fill (in lower Santa Ynez Canyon, Pacific Palisades)-placed in 1926-28, thickness as great as 9m

Qal **Alluvium** (late Holocene)-sand, gravel, and silt; locally includes some colluvium and residual soil; in active stream channels and beneath adjoining flood plains; locally incised to 5 m

Qc **Colluvium**-(Holocene and upper Pleistocene)-silt, clay, and sand, locally with abundant rock fragments; chiefly material that has moved downslope by gravity; commonly mantles slopes mapped as bedrock to depths of 1 m, but locally as thick as 12 m along coastal slopes; principal parent material of debris flows

Qb **Beach deposits** (Holocene) Fine- to medium-grained sand, rounded pebble gravel locally present; thickness less than 5 m

Qfp **Floodplain deposits** (Holocene and upper Pleistocene)-undifferentiated stream, floodplain, and mudflow deposits, chiefly at mouths of ravines; coalesced to form aprons below steep slopes

Qdt **Debris trains**(Holocene and upper Pleistocene)-Angular fragments and blocks of bedrock; chiefly from debris avalanches

Qls/Qls? **Landslide deposits**-Chiefly deposits of bedrock and surficial materials resulting from mass wasting by slides, slumps, falls, and flows; may locally include some scar areas; queried where origin doubtful; in Pacific Palisades divided into:

Qly **Younger landslide deposits** (Holocene)-Pacific Palisades-derived largely from Modelo and Topanga Formations, and from older landslide, terrace cover, and marine terrace deposits; thickness as great as 37 m, but most are less than 15 m thick; all predate 6/30/1969 (McGill, 1989)

Qlo **Older landslide deposits** (chiefly Holocene; Pacific Palisades)-some larger deposits may date from 10,000-20,000 yr B.P. when sea level was much lower than now

Qt/Qtc **Coastal terrace deposits** (Upper Pleistocene)-nonmarine gravel, sand, silt and clay, locally includes debris flow fans and aprons; overlies marine terrace deposits or wave-cut platform

Qtm **Marine terrace deposits** (Upper Pleistocene)-Sand, silty sand, and gravel; clean, loose, to weakly cemented; overlies three emergent erosional platforms between 22 and 76 m above present sea level; intertongues with nonmarine terrace deposits; locally fossiliferous (see table 2)

BEDROCK UNITS

QTs **Sedimentary rocks** (lower Pleistocene or upper Pliocene; in southeast corner of map)-massive marine siltstone and very fine grained sandstone, locally very fossiliferous; maximum exposed thickness about 90 m

Tp **Sedimentary rocks** (upper and lower Pliocene)- marine siltstone, sandstone, and breccia; maximum exposed thickness about 230 m; locally contains angular clasts of Modelo limestone bored by pholads; locally contains late Pliocene macro- and microfossils (see table 2); macrofossils referred to late Pliocene San Diego Formation (Hoots, 1931)

Tmo **Modelo Formation** (upper Miocene)-dominantly interbedded marine sandstone (lithic-arkose wacke) and hemipelagic shaly mudstone, pebble conglomerate locally at base; microfauna in section along north Topanga Canyon Road referred to lower part of Kleinpell's (1938) type Mohnian Stage; **Tml**, coarse-grained sdandstone and pebble-cobble conglomerate

Ti **Intrusive igneous rocks** (middle Miocene)-Basaltic and/or diabasic dikes, sills, and irregular bodies, commonly emplaced along faults; intrude all units older than Calabasas Formation; generally less than 5 m thick, but locally as thick as 330 m

Tt **Topanga Group, undivided** (middle Miocene)-siltstone, sandstone, volcanics, and tuff-bearing conglomerate; divided into:

Ttc **Calabasas Formation**-marine sandstone, siltstone, and shale; locally abundant foramififera in northwest part of map referred to Luisian Stage (late middle Miocene) of Kleinpell (1938); thickness as much as 850 m

Tcob **Volcanic breccia**-chiefly basaltic pillow breccia

Tttc **Topanga Canyon Formation**-marine sandstone, siltstone, and pebbly sandstone; east of Topanga Canyon includes a prominent medial zone of nonmarine sandstone, pebbly sandstone, and mudstone; marine sequence is divided into three members:

Ttcc **Cold Creek Member**-marine sandstone, siltstone, and pebbly sandstone; up to 210 m thick; locally abundant molluscan fauna in northeast part of Malibu Beach quadrangle referred to "Temblor Stage" of Weaver and others (1944), including type locality for Topanga Canyon fauna of Arnold (1907); foraminifera referred to Luisian or Relizian Stages of Kleinpell (1938)

Ttf **Fernwood Member**-nonmarine sandstone, pebbly sandstone (paralic and fluvial), with minor tuff (tuff-bearing pebble conglomerate in Pacific Palisades area), and limestone; as thick as 240 m; on ridge west of Fernwood locally contains shallow-water gastropod Melongena sp. (middle Miocene)

Ttsp **Saddle Peak Member**-marine sandstone,pebbly sandstone, and siltstone; up to 240 m thick; pebble-cobble conglomerate at base locally contains abundant molluscan fossils, including *Vertipecten nevadanus*, referred to early or middle Miocene

Tv **Vaqueros Formation** (lower Miocene)-chiefly marine sandstone, minor pebbly sandstone, and interbedded nonmarine(?) mudstone; as thick as 75 m; present only in southwest part of quadrangle; elsewhere this stratigraphic position is occupied by nonmarine strata in upper part of Sespe Formation; locally contains molluscan fossils, including *Turritella inezana*, referred to lower Miocene "Vaqueros Stage" of Weaver and others (1944);

Ts **Sespe Formation** (upper Eocene, Oligocene, and lower Miocene)-nonmarine sandstone, pebbly sandstone, mudstone, and conglomerate; characteristically a fluvial redbed sequence, but red color locally absent; thickness probably more than 300 m; base not exposed in map area

Tcc **Coal Canyon Formation** (Paleocene and lower-middle Eocene)-marine sandstone, siltstone, pebbly sandstone, and conglomerate; thickness may exceed 1000 m; commonly contains molluscan fauna, including *Turritella pachecoensis*, referred to "Domengine Stage" of Weaver and others (1944). Strathearn and others (1988) describe a section of the Coal Canyon Formation just east of Santa Ynez Canyon (locality **fTC**, table 2) and, on the basis of microfossils, place the Paleocene/Eocene contact just below a 10 meter-thick algal limestone (**Tls**). Colburn and others (1988), on the basis of seven reference sections along the length of the mountains, recognize three principal Paleocene lithosomes and stratigraphic units that are correlated with the "nearly identical" sequence in the Simi Hills.

Kt **Tuna Canyon Formation** (Upper Cretaceous)-Sandstone (turbidites) with slate chips, siltstone, and locally thick, structureless pebble-cobble conglomerate; molluscan fauna includes Campanian ammonite *Metaplacenticeras sp.*; locally contains foraminifera referred to D-2, E, and F-1 zones (Upper Cretaceous) of Goudkoff (1945); <u>east of Topanga Canyon</u> subdivided by Alderson (1988, unpub. map): **Ktb**, sandstone with minor conglomerate and black shale with Turonian and Coniacian ammonites (first report of Coniacian in Santa Monica Mountains), intruded by dike of trachyte, **Ktt**, at north border of quadrangle (Hoots, 1931); **Ktc**, pebble-cobble conglomerate and minor sandstone; **Ktd**, sandstone, fine grained, thick-bedded, fossiliferous; **Kte**, greenish-gray shale, interbedded coarse-grained sandstone in upper part; thickness 2080 m

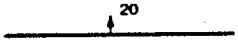
Ktr **Trabuco Formation** (Upper Cretaceous; of Durrell, 1954)-cobble-pebble conglomerate and soft, red clayey arkosic sandstone; well-rounded to polished clasts of varicolored quartzite, porphyry, granite, basalt, and numerous chips of black slate; thickness about 225 m

Jsm **Santa Monica Slate** (Jurassic)-fine-grained, gray to black, intensely jointed, well-developed slaty cleavage; thickness perhaps 1800 m; yields late Oxfordian to early Kimmeridgian pelecypods (Imlay, 1963)

Jsms **Spotted slate**-with abundant well-developed, spindle-shaped crystals of cordierite, inferred to be a metamorphosed facies of Santa Monica Slate (Hoots, 1931)

MAP SYMBOLS

Contact or mapped horizon— Long-dashed where approximately located; short-dashed where inferred; dotted where concealed; queried where doubtful

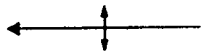


Fault— Showing dip. Long-dashed where approximately located; short-dashed where inferred; dotted where concealed

Thrust fault— Approximately located. Sawteeth on upper plate

Detachment fault— Approximately located. Sawteeth on upper plate

Potrero Canyon fault



Anticline— Approximately located. Showing crestline

Syncline— Approximately located. Showing troughline

Thin dike or sill

Strike and dip of inclined beds

Exploratory well— Number refers to Table 1 below

Fossil locality— F, macrofossil collection; f, microfossil collection; number refers to Table 2 below

Table 1--DATA ON EXPLORATORY WELLS, TOPANGA QUADRANGLE[1]

MAP No.	T	RW	SEC[2]	OPERATOR	NAME/NUMBER	ELEV-ATION (ft.)	TOTAL DEPTH (ft.)	BOT-TOM[3]
495	1S	16	5	Monarch	Sylvia Park 1	1100	1823	M
496	1S	16	*36	Occidental	Marquez EH 1	107	9721	Mu

[1] Data from Yerkes and Showalter, 1990.
[2] Asterisk (*) indicates projected section.
[3] M, Miocene; u, upper.

Table 2--DATA ON FOSSIL LOCALITIES, TOPANGA QUADRANGLE

MAP NO.[1]	T	RW	SEC[2]	COLL-ECTOR[3]	AGE[4]	MAP UNIT	SOURCE
FC3067	1S	16	*25	CSULA	Kl	Ktc?	I. P. Colburn, unpub.
FH17	1S	16	*10	USGS	Kl	Ktc?	Hoots, 1931
FH22	1N	16	33	USGS	Kl?	Ktc	(do.)
FH23	1S	16	*4	USGS	Kl	Ktc	(do.)
FH26	1S	16	*4	USGS	P	Tcc	(do.)
FH27	1S	16	*4	USGS	P	Tcc	(do.)
FH31	1S	16	*36	USGS	Pl/Q	Qp	(do.)
FH41	1s	16	*21	USGS	K?	Ktc?	(do.)
FH46	1S	16	*10	USGS	K?	Ktc?	(do.)
FH47	1S	16	*10	USGS	Kl?	Ktc?	(do.)
FH48	1S	16	*10	USGS	Kl	Ktc	(do.)
FH49	1S	16	*25	USGS	Kl	Ktc	(do.)
FH54	1S	16	*21	USGS	Kl	Ktc	(do.)
FH55	1S	16	*35	USGS	Pl.	Tp	(do.)
FH59	1S	16	*22	USGS	P	Tcc?	(do.)
FH61	1S	16	*35	USGS	Ql	Qsp	(do.)(Buried by af)
FH311	1S	16	*35	USGS	Pl./Q	Qp	(do.)
FM1	1S	16	*32	USGS	Ql	Qtm	McGill, 1989
FM2	1S	16	*28	USGS	Mem	Tttc	(do.)
FY300C	1S	16	31	USGS	Kl	Ktc	Yerkes & Campbell, 1980
FY300E	1S	16	31	USGS	Mm	Tttc	(do.)
FY300G	1S	16	31	USGS	Mm	Tttc	(do.)
FY301B	1S	17	24	USGS	P?	Tcc	(do.)
FY301C	1S	16	31	USGS	K	Ktc	(do.)
FY301F	1S	16	*15	USGS	P	(?)	RFY, unpub.
FY301G	1S	16	*15	USGS	Kl	Ktc?	(do.)
FY301H	1S	16	*15	USGS	P	Tcc	(do.)
FY303G	1S	16	30	USGS	Kl	Ktc	Yerkes & Campbell, 1980
FY304E	1S	16	32	USGS	Kl	Ktc	(do.)
FY305A	1S	16	*20	USGS	P	Tcc	(do.)
FY305B	1S	16	19	USGS	Mem	Ttsp	(do.)
FY307E	1S	16	*20	USGS	Mem	Tttc	(do.)
FY308F	1S	16	18	USGS	Mm	Tttc	(do.)
FY308G	1S	16	2	USGS	Mm	Ttcc	(do.)
FY310E	1S	17	13	USGS	Mm	Ttf	(do.)
FY311A	1S	17	24	USGS	Mem	Ttsp	(do.)
FY341B	1S	17	25	USGS	Em	Tcc?	(do.)
FY341C	1S	16	*16	USGS	Eem	(?)	(do.)
FY361E	1S	17	13	USGS	Mem	Tttc	(do.)
FY363C	1S	17	12	USGS	Mem	Tttc	(do.)
FY364C	1S	17	12	USGS	Mem	Tttc	(do.)
FY364E	1S	17	12	USGS	Mem	Tttc	(do.)
FY367B	1S	17	1	USGS	Mem	Tttc	(do.)
FY367E	1S	17	2	USGS	Mem	Tttc	(do.)
FY373B	1S	17	1	USGS	Mem	Tttc	(do.)
FY375E	1S	17	12	USGS	Mem	Ttcc	(do.)
FY382F	1S	16	*8	USGS	Mm	Ttcc	(do.)
FY383E	1S	16	5	USGS	Mm	Ttf	(do.)
FY390C	1S	17	32	USGS	Mem	Ttcc	(do.)
FY397D	1S	17	25	USGS	P?	Tcc	(do.)

Table 2--DATA ON FOSSIL LOCALITIES, TOPANGA QUADRANGLE

MAP NO.[1]	T	RW	SEC[2]	COLL-ECTOR[3]	AGE[4]	MAP UNIT	SOURCE
fM3	1S	16	*35	USGS	Pl	Tp	McGill, 1989
fM4	1S	16	* 3	USGS	Pl	Tp	(do.)
fM5	1S	16	*28	USGS	Mml	Tttc	(do.)
fM6	1S	16	*33	USGS	Mm	Tttc	(do.)
fM7	1S	16	*33	USGS	Mm	Tttc	(do.)
fM8	1S	16	*33	USGS	Mml	Tttc	(do.)
fM9	1S	16	*33	USGS	Mm	Tttc	(do.)
fM10	1S	16	*35	USGS	Pl	Tp	(do.)
fTC	1S	16	*16	LACM	Pl-Ee	Tcc	Strathearn, Griffis, and Ingram, 1988
fY363B	1S	17	12	USGS	Mem	Tttc	Yerkes & Campbell, 1980
fY375D	1S	17	1	USGS	Ml?	Ttc	(do.)
fY393D	1S	16	6	USGS	Mem	Ttc	(do.)
fY390B	1S	16	5	USGS	Mem	Ttcc	(do.)
fY370C	1S	17	12	USGS	Mm	Ttcc	(do.)
fY375B	1S	16	7	USGS	Ml?	Ttc	(do.)
fY375C	1S	16	6	USGS	Ml?	Ttc	(do.)
fY375D	1S	17	1	USGS	Ml?	Ttc	(do.)
fY376C	1S	16	1	USGS	Ml	Tmo	(do.)
fY382C	1N	16	*8	USGS	Mem	Ttcc	(do.)
fY383D	1S	16	*5	USGS	Mem	Ttcc	(do.)

[1]F, macrofossil collection; f, microfossil collection.
[2]asterisk (*) indicates projected section.
[3]CSULA, California State Univ., Los Angeles; LACM, Los Angeles County Museum of Natural History; USGS, U. S. Geol. Survey.
[4]E, Eocene; K, Cretaceous; M, Miocene; P, Paleocene; Pl., Pliocene; Q, Pleistocene; e, early; l, late; m, middle. Example: Mem, Miocene, early to middle.

References

Alderson, J. M., 1988, New age assignments for the lower part of the Cretaceous Tuna Canyon Formation, Santa Monica Mountains, California (abs.): Geol. Soc. America Abstracts with Programs, vol. 20, no. 3, p. 139.

Arnold, Ralph, 1907, New and characteristic species of fossil mollusks from the oil-bearing Tertiary formations of southern California: U. S. National Museum Proc., vol. 32, p. 525-546.

Colburn, I. P., Jakobsen, C. M., and Novak, G. A., 1988, The Paleocene stratigraphy of the Santa Monica Mountains, Los Angeles County, California: *in* Filewicz, M. V., and Squires, R. L., eds., Paleogene Stratigraphy, West Coast of North America, Pac. Sec. Soc. Econ. Paleont. Mineral., West Coast Symp. vol. 58, p. 59-72.

Durrell, C., 1954, Geology of the Santa Monica Mountains, Los Angeles and Ventura Counties: Calif. Div. Mines Bull. 170, map sheet 8.

Fritsche, A. E., *comp.*, 1973, Map of Cretaceous sedimentary exposures in the eastern Santa Monica Mountains, California *in* Cretaceous Stratigraphy of the Santa Monica Mountains and the Simi Hills: Soc. Econ. Paleont. Mineral., Pac. Sec. Guidebk., p. 3-13.

Goudkoff, P. P., 1945, Stratigraphic relations of Upper Cretaceous in Great Valley of California: Amer. Assoc. Petrol. Geol. Bull. vol. 29, no. 7, p. 956-1007.

Hoots, H. W., 1931, Geology of the eastern part of the Santa Monica Mountains, Los Angeles County, California: U. S. Geol. Survey Prof. Paper 165, p. 83-134, pl. 16 at scale 1:24,000.

Imlay, R. W., 1963, Jurassic fossils from southern California: Jour. Paleont., vol. 37, no. 1, p. 97-107.

Kleinpell, R. M., 1938, Miocene stratigraphy of California: Amer. Assoc. Petrol. Geol., Tulsa, OK., 450 p., 27 pls.

McGill, J. T., 1989, Geologic maps of the Pacific Palisades area, Los Angeles, California: U. S. Geol. Survey Map I-1828, scale 1:4800.

Morton, D. M., and Kennedy, M. P., 1989, A southern California digital 100,000-scale geologic map series: the Santa Ana quadrangle, the first release (abs.): Geol. Soc. America Abs. with Progs., vol. 21, no. 6, p. A107-A108.

Stratheam, G. E., Griffis, K., and Ingram, B. L., 1988, Palynomorphs and benthic foraminifera from a portion of the Coal Canyon Formation (Paleocene-Eocene) *in* Filewicz, M. V., and Squires, R. L., *eds.*, Paleogene Stratigraphy, West Coast of North America: Soc. Econ. Paleont. Mineral., Pac. Sec. West Coast Paleogene Symp., vol. 58, p. 73-82.

Weaver, C. E., *chm.*, and others, 1944, Correlation of the marine Cenozoic formations of western North America: Geol. Soc. America Bull., vol. 55, no. 6, p. 569-598.

Weber, F. H. Jr., and Frasse, J. A., 1984, Inventory of recent damaging slope failures, prehistoric landslides, and geologic relationships within the Topanga and Canoga Park quadrangles, Los Angeles County, California: Calif. Div. Mines and Geol. unpub. report to U. S. Geol. Survey, 32 p., 2 pls. at scale 1:24,000.

Wentworth, C. M., and Fitzgibbon, T. T., 1991, Alacarte User Manual-(Ver. 1.0): U. S. Geol. Survey Open File Rpt. 91-587C, 267 p.

Yerkes, R. F., and Campbell, R. H., 1980, Geologic map of the east-central Santa Monica Mountains, Los Angeles County, California: U. S. Geol. Survey Map I-1146, scale 1:24,000.

Yerkes, R. F., and Showalter, P. K., 1990, Exploratory wells drilled in the Los Angeles, California 1:100,000 quadrangle: U. S. Geol. Survey Open File Rpt. 90-627, 1 map at scale 1:100,000.